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| 10/695,160 | 10/29/2003 | Howard E. Rhodes | M4065.0939/P939 | 7143 |
| 24998 | 7590 | 11/23/2005 | EXAMINER | |
| DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP | | | HO, TU TU V | |
| 2101 L Street, NW | | | ART UNIT | |
| Washington, DC 20037 | | | PAPER NUMBER | |
| | | | 2818 | |

DATE MAILED: 11/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/695,160 | RHODES, HOWARD E. | |
| | Examiner | Art Unit | |
| | Tu-Tu Ho | 2818 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-240 is/are pending in the application.
- 4a) Of the above claim(s) 51-234 and 236-240 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-50 and 235 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 November 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's Amendment filed 11/07/2005 has been reviewed and placed of record in the file.

Election/Restrictions

2. This application contains claims 51-234 and 236-240 drawn to an invention nonelected with or without traverse in the replies filed 02/22/2005, 05/04/2005, 06/27/2005, and 08/04/2005. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.
3. Applicant's arguments with respect to amended claims 1-50, filed 11/07/2005, have been considered but they are moot in view of new ground(s) of rejection.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, (d.1) the "said region has a **higher** dopant concentration **near the surface** of the substrate" in "a first region doped to a first conductivity type located below the surface of the substrate, said region having a graded profile, wherein said region has a higher dopant concentration near the surface of the substrate" of **claim 1**, (d.2) the "**undoped** region" in "a second undoped region laterally adjacent to said first doped region" of **claim 30**, and (d.3) the "**beneath**" in "a second region doped to a second conductivity

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type located beneath said first doped region for collecting photogenerated charges” of **claim 1**, in “a third region doped to a second conductivity type located beneath said first doped region for collecting photogenerated charges” of **claim 30**, and in “a second region doped to a second conductivity type located beneath said first doped region and separation region for collecting photogenerated charges” of **claim 235** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

For (d.3), however, the broad meaning of beneath, i.e., a portion of, for example, a second region doped to a second conductivity type (a portion of which second region is) located beneath said first doped region and separation region for collecting photogenerated charges, together with the not-so-broad meaning of beneath will be interpreted for examination purposes, all in the interest of compact prosecutions. To be more specific, none of the figures of the present invention discloses a second region doped to a second conductivity type, wherein a whole portion of which second region is located beneath said first doped region and separation region for collecting photogenerated charges.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the

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renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-30 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 recites:

a photoconversion device comprising:

a substrate (such as 102, Fig. 4) having a surface;

a first region (such as 104a/104b) doped to a first conductivity type (p) located below the surface of the substrate, said region having a graded profile, wherein said region has a higher dopant concentration near the surface of the substrate; and

a second region (135) doped to a second conductivity type (n) located beneath said first doped region for collecting photogenerated charges.

However, the specification describes that “[R]egion 104b is formed to have a p-type dopant concentration which is less than the p+ dopant concentration in region 104a” (paragraph [0079]), where as clearly depicted in Fig. 4, region 104b is near the surface of the substrate, thereby disclosing that said region (104a/104b) has a lower dopant concentration near the surface of the substrate.

Claims 2-29 depend from rejected claim 1 and include all limitations of claim 1; therefore these claims are rejected for the same reason.

Claim 30 recites:

a photoconversion device comprising:

a substrate (such as 102, Figs. 4 and 5A-5H) having a surface;

a first region (such as 104a/104b) doped to a first conductivity type (p) located below the surface of the substrate;

a second region undoped region (171) laterally adjacent to said first doped region; and

a third region (135) doped to a second conductivity type (n) located beneath said first doped region for collecting photogenerated charges.

However, the second region 171 is part of the substrate 102 (see Figs. 5A through 5H), which is doped (paragraph [0069]). While the specification describes the region 171 as “having no photodiode p-type implantations” (paragraph [0048]) in the process of doping other regions, this is not the same as being undoped because the region 171, which is part of the substrate, is already a doped region because the substrate is a doped region.

Nevertheless, in the interest of compact prosecutions, both situations, namely (iso.1) the second region is doped - according to the doping of the substrate similarly to the present

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invention or other means, and (iso.2) the second region is an oxide insulation region, will be treated.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. **Claims 30-37, 40-44, and 46-50** are rejected under 35 U.S.C. 102(e) as being anticipated by Patrick U.S. Patent Application Publication 20040173799 (cited in a previous office action, and hereinafter the '799 reference).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

The '799 reference discloses in the figures, particularly Fig. 19, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '799 reference discloses a photoconversion device comprising:

a substrate (110, Fig. 19) having a surface;

a first region (170 or 270) doped to a first conductivity type (p, Figs. 7-19, paragraphs [0075] to [0077]) located below the surface of the substrate;

a second region (280, Fig. 19, reference 280 added by the examiner for ease of explanation – and see details iso.1 in the 112 rejections above, i.e., the second region is *doped* - according to the

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doping of the substrate similarly to the present invention or other means) laterally adjacent to said first doped region; and

a third region (126 or 226) doped to a second conductivity type (n, paragraph [0079]) (a portion of which third region is – and see details d.3 in the drawing objections above) located beneath said first doped region for collecting photogenerated charges (paragraph [0045]).

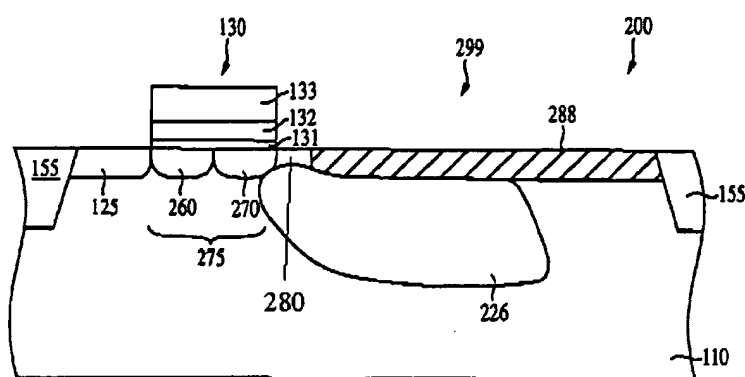


FIG. 19

Note: Numerical Reference 280 added by the examiner for ease of explanation

Referring to **claim 31**, the reference further discloses that said first conductivity type is p-type, as noted above.

Referring to **claim 32**, the reference further discloses that said first conductivity type is n-type, as noted above.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration.

Referring to **claim 34**, the reference further discloses that said second region (280) does not have a dopant concentration of said first conductivity type.

Referring to **claims 35-37**, the reference further discloses a first dopant concentration as claimed (paragraph [0075], and note that the reference discloses the concentration in a three-dimensional format as opposed to the claimed two-dimensional format, but the claimed and the disclosed are about the same for all practical purposes; for a conversion between the two formats, as far as dopant concentration in the pertinent art is concerned, see, for example Farb U.S. Patent 5,006,477, column 2, lines 46-67).

Referring to **claim 40**, the reference further discloses that said first doped region is implanted with BF₂ or B¹¹ dopant ions (“boron”, paragraph [0075]).

Referring to **claims 41-42 and 49-50**, the limitations “wherein said dopant ions are implanted with an implant energy of from about 1 keV to about 40 keV” and “wherein said third doped region is formed with an implant energy of from about 30 keV to about 300 keV” are “product-by-process” limitations and are considered non-limitation in a device claim.

Referring to **claim 43**, the reference further discloses that said photoconversion device is part of a CMOS imager (paragraph [0003]).

Referring to **claim 44**, the reference further discloses that said photoconversion device is a 3-T device (paragraph [0003], the photogate constitutes 1T, a transferring transistor constitutes another T, and a resetting transistor constitutes yet another T).

Referring to **claim 46**, the reference further discloses that said second conductivity is provided from the group comprising of arsenic, antimony, or phosphorus ions (paragraphs [0079] and [0063]).

Referring to **claims 47-48**, the reference further discloses that said third doped region (126 or 226) is formed with an angled implantation having an angle from about 0 to about 89 degrees (paragraph [0063]: “different than a 90 degree”).

7. **Claims 30-34,40-43,45,46,49,50 and 235** are rejected under 35 U.S.C. 102(b) as being anticipated by Kawakami et al. U.S. Patent Application Publication 20020047115 (hereinafter the '115 reference).

The '115 reference discloses in the figures, particularly Figs. 56D and 58E, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '115 reference discloses a photoconversion device comprising:

- a substrate (301, Fig. 58E) having a surface;
- a first region (304, Fig. 58D; or 104, Fig. 56D) doped to a first conductivity type (p, paragraphs [0121], [0127] and [0131]) located below the surface of the substrate;
- a second region (305 or 105 - *and see details iso. 1 in the 112 rejections above*, i.e., the second region is *doped* - according to the doping of the substrate similarly to the present invention or other means) laterally adjacent to said first doped region; and
- a third region (333/332) doped to a second conductivity type (n, paragraph [0127]) located beneath said first doped region for collecting photogenerated charges ("charge storing", paragraph [0127]).

Referring to **claim 235** and using the same reference characters, citations, and interpretation as detailed above for claim 30 where applicable, the reference discloses a photoconversion device comprising:

- a substrate having a surface;

a first region (304/305, Fig. 58D; or 104/105, Fig. 56D) doped to a first conductivity type located below the surface of the substrate, said region having a dopant gradient profile (*different concentrations of p*, paragraphs [0121], [0127] and [0131]);

a separation region (*thermal oxide region 313 - and see details iso.2 in the 112 rejections above, i.e., the second region is an oxide insulation region*); and

a second region (333/332) doped to a second conductivity type (*a portion of which second region is – and see details d.3 in the drawing objections above*) located beneath said first doped region (304/305, Fig. 58D; or 104/105, Fig. 56D) and separation region (*thermal oxide region 313*) for collecting photogenerated charges.

Referring to **claim 31**, the reference further discloses that said first conductivity type is p-type, as noted above.

Referring to **claim 32**, the reference further discloses that said first conductivity type is n-type, as noted above.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration (p⁺ as cited above).

Referring to **claim 34**, the reference further discloses that said second region (305, which is p as cited above) does not have a dopant concentration (p⁺) of said first conductivity type.

Referring to **claim 40**, the reference further discloses that said first doped region is implanted with BF₂ or B¹¹ dopant ions (“boron”, paragraph [0127]).

Referring to **claims 41-42 and 49-50**, the limitations “wherein said dopant ions are implanted with an implant energy of from about 1 keV to about 40 keV” and “wherein said third

doped region is formed with an implant energy of from about 30 keV to about 300 keV” are “product-by-process” limitations and are considered non-limitation in a device claim.

Referring to **claim 43**, the reference further discloses that said photoconversion device is part of a CMOS imager (paragraph [0138]).

Referring to **claim 45**, the reference further discloses that said photoconversion device is part of a CCD imager (paragraph [0138]).

Referring to **claim 46**, the reference further discloses that said second conductivity (n) is provided from the group comprising of arsenic, antimony, or phosphorus ions (paragraphs [0127] and [0131]).

8. **Claims 30-35** are rejected under 35 U.S.C. 102(b) as being anticipated by Sin U.S. Patent 5,962,882 (hereinafter the ‘882 reference).

The ‘882 reference discloses in the figures, particularly Fig. 8, and respective portions of the specification a photoconversion device as claimed.

Referring to **claims 30-32**, the ‘882 reference discloses a photoconversion device comprising:

a substrate (generally indicated at the region below layer 84, Fig. 8) having a surface;
a first region (82) doped to a first conductivity type (p) located below the surface of the substrate;

a second region (78/76 or 76 - *and see details iso.1 in the 112 rejections above*, i.e., the second region is *doped* - according to the doping of the substrate similarly to the present invention or other means) laterally adjacent to said first doped region; and

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a third region (74) doped to a second conductivity type (n) located beneath said first doped region for collecting photogenerated charges.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration (p+).

Referring to **claims 34-35**, the reference further discloses that said second region (76, which has a dopant concentration of p, which is different from p+) does not have a dopant concentration (p+) of said first conductivity type.

9. **Claims 30 and 33-34** are rejected under 35 U.S.C. 102(b) as being anticipated by Burke at al. U.S. Patent Application Publication 20020048837 (hereinafter the '837 reference).

The '837 reference discloses in the figures, particularly Fig. 11E, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '837 reference discloses a photoconversion device comprising:

a substrate (42, Fig. 11A) having a surface;

a first region (36 or 36/38, Figs. 11D-11E) doped to a first conductivity type (n) located below the surface of the substrate;

a second region (38, when the first region is 36, or 14b, when the first region is 36/38 - *and see details iso.1 in the 112 rejections above*, i.e., the second region is *doped* - according to the doping of the substrate similarly to the present invention or other means) laterally adjacent to said first doped region; and

a third region (48) doped to a second conductivity type (p) located beneath said first doped region for collecting photogenerated charges.

Referring to **claim 33**, the reference further discloses that said first doped region (36 or 36/38) has a first dopant concentration (n^+ or n^+/n^-).

Referring to **claim 34**, the reference further discloses that said second region (38, which has a dopant concentration of n^- , which is different from n^+ ; or 14b, which has a dopant concentration of n , which is different from n^+/n^-) does not have a dopant concentration (n^+ or n^+/n^-) of said first conductivity type.

10. Claims 30 and 33-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Effelsberg U.S. Patent 5,430,321 (hereinafter the '321 reference).

The '321 reference discloses in the figures, particularly Fig. 4, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '321 reference discloses a photoconversion device comprising:
a substrate (generally indicated at the region below layer 21, Fig. 4) having a surface;
a first region (20) doped to a first conductivity type (n , Figs. 2-4, columns 3 and 4, particularly column 4, lines 53-58) located below the surface of the substrate;
a second undoped region (18b) laterally adjacent to said first doped region; and
a third region (11') doped to a second conductivity type (p , Figs. 2-4, columns 3 and 4, particularly column 4, lines 50-55, and column 3, lines 50-55) located beneath said first doped region for collecting photogenerated charges.

Referring to **claim 33**, the reference further discloses that said first doped region (20) has a first dopant concentration (doping "profile" 14, Fig. 3, column 4, particularly first full paragraph and last paragraph).

Referring to **claim 34**, the reference further discloses that said second region (18b, which is an oxide region, which has no dopant concentration, which is different from doping profile 14) does not have a dopant concentration (doping profile 14) of said first conductivity type.

11. Claims 30 and 33-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Pan U.S. Patent 6,287,886 (hereinafter the '886 reference).

The '886 reference discloses in the figures, particularly Fig. 4, and respective portions of the specification a photoconversion device as claimed.

Referring to **claim 30**, the '886 reference discloses a photoconversion device comprising:

- a substrate (42, Fig. 4) having a surface;
- a first region (55) doped to a first conductivity type (n, "phosphor", column 3, lines 39-45) located below the surface of the substrate;
- a second undoped region (44) laterally adjacent to said first doped region; and
- a third region (43) doped to a second conductivity type (p, columns 3, lines 14-16) located beneath said first doped region for collecting photogenerated charges.

Referring to **claim 33**, the reference further discloses that said first doped region (55) has a first dopant concentration (column 3, lines 39-45).

Referring to **claim 34**, the reference further discloses that said second region (44, which is an oxide region, which has no dopant concentration) does not have a dopant concentration of said first conductivity type.

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12. Claims 30-35 are rejected under 35 U.S.C. 102(e) as being anticipated by Suzuki et al. U.S. Patent 6,417,023 (hereinafter the '023 reference).

The '023 reference discloses in the figures, particularly Figs. 6 and 17, and respective portions of the specification a photoconversion device as claimed.

Referring to **claims 30-32**, the '023 reference discloses a photoconversion device comprising:

a substrate (generally indicated at the region below layer 37, Fig. 8 or Fig. 17) having a surface;

a first region (38 or generally indicated at 38, which is mainly p+ and which includes a portion of p-well 351, which is p and which is not p+, Fig. 6; or which is mainly p+ and which includes a portion of p-well 94 and a portion of p+ trench liner 95, Fig. 17) doped to a first conductivity type (p) located below the surface of the substrate;

a second undoped region (34, a LOCOS, which is an isolation region, Fig. 6, column 6, lines 28-34; or 92, a region of silicon dioxide, which is undoped, Fig. 17, column 13, lines 42-47) laterally adjacent to said first doped region; and

a third region (36 or 36/33) doped to a second conductivity type (n) located or a portion of which is located beneath said first doped region (38 or generally indicated at 38) for collecting photogenerated charges.

Referring to **claim 33**, the reference further discloses that said first doped region has a first dopant concentration (p+ or generally p+).

Referring to **claims 34-35**, the reference further discloses that said second region (34 or 92, which is truly undoped, which is different from p+ or generally p+) does not have a dopant concentration (p+ or generally p+) of said first conductivity type.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 7-11,13-16,23,26,27,35-39,44,47 and 48 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kawakami et al. U.S. Patent Application Publication 20020047115 (hereinafter the '115 reference).

Referring to **claim 44**, the reference discloses a photoconversion device as claimed and as detailed above for claim 43 wherein said photoconversion device is part of a CMOS imager, but does not teach that said CMOS imager is a 3T, 4T, 5T, 6T, or 7T device (where T is transistors). However, since the reference also fails to limit the number of transistors that could be used with the CMOS imager, it would be obvious to one of ordinary skill in the art to form the CMOS imager such that it contains as many switching and control transistors as needed.

Referring to **claims 35-37**, the reference discloses a first dopant concentration for the first doped region 304 but does not disclose a range of values as claimed. Specifically, the reference discloses in paragraph [0121] a dosage of $1 \times 10^{12}/\text{cm}^2$ for sub-region 304. Nevertheless, at the time the invention was made, providing certain range of values, as claimed in the instant case,

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from a certain range of values, namely, said ranges of dosages for the sub-regions of the first doped region, to achieve the same result were within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such providing would have been obvious.

Referring to **claims 38-39**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 30 wherein said first doped region (304) is formed with an angled implantation (paragraph [0131]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Referring to **claims 47-48**, the '115 reference discloses a photoconversion device as claimed and as detailed above for claim 30 including said third doped region 333/332. The reference further teaches that the third doped region 333/332 is formed with an angled implantation (paragraph [0130]: "skew implantation", Figs. 58D and 58E). However, the reference fails to teach an angle as claim. Nevertheless, at the time the invention was made, selecting certain range of values, as claimed in the instant case, within certain range of values, namely, a range of different angles of the disclosed skew implantation taught by the reference, were still within a skill of a person of ordinary skill in the art and were still considered routine skill, therefore, such selection would have been obvious.

Response to Arguments

14. Applicant's arguments with respect to claim 235, filed 11/07/2005, have been fully considered but they are not persuasive.

In response to applicant's argument on page 37 that the '115 references does not disclose a separation region as recited in claim 235, it is respectfully pointed out that the reference discloses a separation as claimed. Region 313 (Fig. 58) separates at least regions 304/305 from region 322, thereby making the region 313 a separation region.

With respect to Applicant's argument on page 36 that the reference does not disclose the limitation "beneath" in "a second region doped to a second conductivity type located beneath said first doped region and separation region for collecting photogenerated charges", it is respectfully pointed out that the reference discloses a second region (333/332) doped to a second conductivity type (*a portion of which second region is – and see details d.3 in the drawing objections above*) located beneath said first doped region (304/305, Fig. 58D; or 104/105, Fig. 56D) and separation region (*thermal oxide region 313*) for collecting photogenerated charges. Specifically, the broad meaning of beneath, i.e., a portion of, for example, a second region doped to a second conductivity type (a portion of which second region is) located beneath said first doped region and separation region for collecting photogenerated charges has been interpreted. To be more specific, none of the figures of the present invention discloses "a second region doped to a second conductivity type located beneath said first doped region and separation region for collecting photogenerated charges", wherein a **whole** portion of said second region is located beneath said first doped region and separation region for collecting photogenerated charges. In short, Applicant is not consistent in interpreting the meaning of "beneath".

With respect to Applicant's argument on page 37 that the reference does not disclose the limitation graded profile, it is respectfully pointed out that the reference discloses a first region (304/305, Fig. 58D; or 104/105, Fig. 56D) doped to a first conductivity type located below the surface of the substrate, said region having a dopant gradient profile (*different concentrations of p, paragraphs [0121], [0127] and [0131]*), which is the same as Applicant's claimed first region (104a/104b).

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. See MPEP § 706.07(a).

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

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16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
November 16, 2005